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PATENT CLAIMS

1. Process for the preparation of copolymers of
A) (meth)acrylamides (A) of the formula I



in which:

$$\text{R}^1 = \text{H or CH}_3,$$

R^2 is an alkyl or aryl radical having up to 36 C atoms, which may additionally contain oxygen, nitrogen, sulphur and phosphorus atoms in the form of typical organic functionalities, such as an ether, alcohol, acid, ester, amide, imide, phosphonic acid, phosphonic ester, phosphoric ester, phosphinic acid, phosphinic ester, sulphonic acid, sulphonic ester, sulphinic acid or sulphinic ester function, silicon, aluminium and boron atoms or halogens, such as fluorine, chlorine, bromine or iodine, may denote methyl, ethyl, propyl, 2-propyl, butyl, tert-butyl, hexyl, ethylhexyl, octyl, dodecyl, octadecyl or $-\text{R}_3\text{-PO}(\text{OR}_4)_2$; where R_3 is an alkyl radical having up to 12 C atoms and R_4 is an alkyl having up to 4 C atoms, methylenedimethylphosphonate or methylenediethylphosphonate.

B) alkyl (meth)acrylates $\text{H}_2\text{C}=\text{CR}^1\text{COOR}^5$

in which: R^1 has the abovementioned meanings. R^5 may assume the meanings of isopropyl or tert-butyl or isobutyl, and R^5 may furthermore be a longer-chain secondary or a longer-chain tertiary alcohol.

C) a water-containing diluent and optionally further monomers copolymerizable with A) or B), characterized in that the monomers A) and B) are used in a molar ratio of 1:10 to 10:1.

2. Process according to Claim 1, characterized in that the monomers A) and B) are used in a molar ratio of 1:5 to 5:1.
3. Process according to Claim 1, characterized in that the monomers A) and B) are used in a molar ratio of 1:2 to 2:1.
4. Process according to Claim 1, characterized in that the diluent C) used is a mixture of methanol, water and optionally further organic solvents.
5. Process according to Claim 1, characterized in that the diluent C) comprises more than 50% by weight of water.
6. Process according to Claim 1, characterized in that the diluent C) comprises more than 80% by weight of water.
7. Process according to Claim 1, characterized in that the monomer (B) used is tert-butyl methacrylate.
8. Process according to a Claim 1, characterized in that the copolymer is converted into a polymethacrylimide by heating with elimination of gaseous reaction products.
9. Process according to Claim 1, characterized in that the alkyl esters of the copolymer are first cleaved by catalysis and the reaction product is converted into a polymethacrylimide in a second step by heating.

10. Composition comprising copolymer according to any of the above claims and additional blowing agents.
11. Composition according to Claim 10, characterized in that the blowing agent is an alcohol having 3-8 carbon atoms, urea, N-monomethyl- and/or N,N'-dimethylurea, formic acid, formamide and/or water.
12. Process for the production of foam, characterized in that copolymer or a composition according to any of Claims 1 to 11 is moulded to give a moulding and then foamed by heating.
13. Use of the copolymers obtainable according to any of Claims 1 to 11 as general moulding material.
14. Use of the moulding materials according to Claim 13 for the production of foams.
15. Process for the production of foam bodies, characterized in that moulding material according to Claim 13 is processed by foam extrusion or foam injection moulding.
16. Use of the copolymers obtainable according to any of Claims 1 to 9 for the use or production of coating materials.
17. Use of the copolymers obtainable according to any of Claims 1 to 9 for the use or production of membrane materials.
18. Use of the foams stated in any of Claims 12, 14 and 15 in sandwich constructions.
19. Use of the foams or sandwich constructions which can be produced according to any of the preceding claims in space craft, aircraft, water vehicles or

land vehicles.